

## An experimental study of the consciousness of tonality II. On minor tonality

著者	Aizawa Mutuo
journal or publication title	Tohoku psychologica folia
volume	3
number	4
page range	205-214
year	1936-03-15
URL	<a href="http://hdl.handle.net/10097/00130390">http://hdl.handle.net/10097/00130390</a>

# An experimental study of the consciousness of tonality

## II. On minor tonality

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### 1. Experiment

This experimental study of minor-tonality was done from the same standpoint as that of major-tonality<sup>1</sup>; here also, the object was to investigate our consciousness of tonality by utilizing the melody-singing experiment. As to details in experimental procedure, however, there are some differences.

This time, the method of experiment was more systematised than before. The series of experiments was divided into two large groups, and each of them again into four series.

#### Experiment A.

Series I            t   t   t   t

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<sup>1</sup>. Aizawa, M. An experimental study of the consciousness of tonality. I (Toh. Psych. Fol., 3, 1935-6, 41-52)

Series II	d	d	d	d
Series III	t	d	t	d
Series IV	d	t	d	t

## Experiment B.

Series I	t	T	t	T
Series II	d	D	d	D
Series III	t	D	t	D
Series IV	d	T	d	T

t . . . a minor melody beginning on the tonic

d . . . a minor melody beginning on the dominant

T . . . a major melody beginning on the tonic

D . . . a major melody beginning on the dominant

The object of Experiment A was to see how the tone relation of minor tonality is felt by us in a naive attitude (i. e. an attitude which is not influenced by knowledge of the theory of music), that of Experiment B, to see how the relation between major- and minor-tonality was appreciated. Before the experiment, the names of the melodies which correspond to each series mentioned above was noted on the music-paper for each subject. The melodies were selected according to their familiarity to the latter. Generally the subjects did not know so many melodies in minor, but it was possible to select as many melodies as necessary by using modern Japanese minor tunes.

The melodies used in this experiment were as follows.

t . . . "Tennen no bi" "Konjikiyasya" "Tokyo kosin kyoku" "Sendo kouta"

d . . . "Kojo no tuki" "Kimi koisi" "Sake wa namida ka" "Senyu"

T . . . "Otete tunaide" "Aobayama bankoni sigeku" "The last rose of summer" "Home sweet home" "The theme of the Andante from the 'Surprise' Symphony"

D . . . "Auld lang syne" "Die Lorelei" "Der Lindenbaum" "Sora wa tohoku" "Ryosyu"

Among these, one tune ("Senyu" of 'd') was, strictly speaking, not a minor tune but was constructed in one of Japanese scales called

In-Senpo (陰旋法)<sup>1</sup>. Yet, the melody, influenced by European scale, could be seen as a minor one beginning on the dominant (especially in the early part). This is a very popular tune in Japan and was counted as the most familiar one by our three subjects, so I used it in the cases in which they took part in the experiment.

In the present experiment, also, the 'agreeable and easily intonable tone' was required. At the beginning and the end of each series, subjects were asked to intonate this tone at the moment. The time-interval between each melody was about 5-10 seconds. The use of the keyboard, the curtailment of real singing, mental singing after the real singing, the recording of the introspective reports, . . . etc. were the same as before.

The subjects were 8 in all, and among them 6 were the same as those of the previous experiment. Each series of experiments was gone through 3 times in the case of each subject.

## 2. Result

Each series in Exp. A and B contains 3 transitions of melody and 2 'agreeable' tones, so  $3 \times 3 \times 4 \times 2 \times 8 = 576$  of the former and  $2 \times 3 \times 4 \times 2 \times 8 = 384$  of the latter in all were recorded. To these the same method of observation as before was applied, and the cases of the 'same tonality', 'same tone', 'upper and under second', . . . etc.<sup>2</sup> were distinguished.

### A.) Result of Exp. A.

The total of the results of Series III and IV was as follows :

Table 1.

Case of same tonality	57 % (82)
Case of same tone	30 % (43)
Case of upper and under second	6 % (9)
Other cases	7 % (10)

<sup>1</sup>. This is an most important scale in Japanese music, and has the following series of tones :

C    bD    F    G    bA    (bB)    —  
宮    商    角    徵    羽    (嬰羽)

In this series of tones, generally, bB is used only in the ascending movement of melodies as a leading tone instead of bA(羽). So when we omit this and grant F(角) the right of the tonic, we easily gain a minor pentatonic scale : C D bE G bA. The Japanese In-Senpo and the European minor scale are originally of quite different natures, yet we often can find an example of combination of these in modern Japanese popular songs. "Senyu" was such a case.

<sup>2</sup>. See the previous article.

The next table shows this per each subject :

Table 2.

Subject	Ab.	Ay.	Az.	Mk.	Sk.	Tb.	Tk.	Tr.	Total
Case of same tonality	2	14	14	18	13	3	10	8	82
Case of same tone	5	3	0	0	5	12	8	10	43
Case of upper and under second	8	0	1	0	0	0	0	0	9
Other cases	3	1	3	0	0	3	0	0	10

In Series I and II, the cases were as follows :

Table 3.

Subject	Ab.	Ay.	Az.	Mk.	Sk.	Tb.	Tk.	Tr.	Total
Case of same tonality (tone)	10	18	14	16	18	14	18	15	123(85%)
Case of fourth* and fifth	4	0	3	0	0	2	0	2	11 (8%)
Case of second	3	0	1	2	0	2	0	1	9 (7%)
Other cases	1	0	0	0	0	0	0	0	1

\*. This is a case in which the first tones of neighbouring melodies differ by a fourth or fifth.

As to the 'agreeable and easily intonable tone', the following results were gained :

Table 4.

Subject	Ab.	Ay.	Az.	Mk.	Sk.	Tb.	Tk.	Tr.	Total
Case of T.**	10	22	21	13	16	7	15	19	123(64%)
Case of D.	8	0	1	8	5	10	9	3	44(23%)
Other cases	6	2	2	3	3	7	0	2	25(13%)

\*\*, T. means tonic, and D. dominant.

B.) The result of Exp. B.

The total of the results in Series I and II :

Table 5.

Subject	Ab.	Ay.	Az.	Mk.	Sk.	Tb.	Tk.	Tr.	Total
Case of same tonality (tone)	6	14	18	17	14	11	14	13	107(74%)
Case of fourth and fifth	3	4	0	1	3	5	2	2	20(14%)
Case of second	2	0	0	0	0	1	1	2	6 (4%)
Other cases	7	0	0	0	1	1	1	1	11 (8%)

The total of Series III and IV :

Table 6.

Subject	Ab.	Ay.	Az.	Mk.	Sk.	Tb.	Tk.	Tr.	Total
Case of same tonality	8	15	14	18	2	10	10	18	95(66%)
Case of same tone	3	3	1	0	13	5	7	0	32(22%)
Case of second	3	0	0	0	2	0	1	0	6 (5%)
Other cases	4	0	3	0	1	3	0	0	11 (7%)

The results regarding the 'agreeable' tone :

Table 7.

Subject	Ab.	Ay.	Az.	Mk.	Sk.	Tb.	Tk.	Tr.	Total
Case of T.	10	19	22	20	10	9	15	3	108(56%)
Case of D.	4	5	2	1	9	11	9	17	58(30%)
Other cases	10	0	0	3	5	4	0	4	26(14%)

C.) The total of the results of Exp. A and B.

The result about the 'agreeable' tone :

Table 8.

Case of T.	231 (63 %)
Case of D.	102 (27 %)
Other cases	51 (10 %)

The total numbers of cases in each series :

Table 9.

Series	I	II	III	IV
Case of same tonality	128	102	86	91
Case of same tone	128	102	37	38
Case of second	3	12	8	7
Other cases	13	30	13	8

The cases in each subject :

Table 10.

Subject	Ab.	Ay.	Az.	Mk.	Sk.	Tb.	Tk.	Tr.
1.) S. I+S. II								
Case of same tonality	16	32	32	33	32	25	32	28
Case of fourth and fifth	7	4	3	1	3	7	2	4
Case of second	5	0	1	2	0	3	1	3
Other cases	8	0	0	0	1	1	1	1
2.) S. III+S. IV								
Case of same tonality	10	29	28	36	15	13	20	26
Case of same tone	8	6	1	0	20	17	15	10
Case of second	11	0	1	0	2	0	1	0
Other cases	7	1	6	0	1	6	0	0
3) 'Agreeable' tone								
Case of T.	20	41	43	33	26	16	30	22
Case of D	12	5	3	9	14	21	18	20
Other cases	16	2	2	6	8	11	0	6

### 3. Consideration of results and introspections

The numbers indicated in Table 1 can be compared with the corresponding table for major as the result concerning minor-tonality, while the relation of melodies in Series III and IV was

the same as that of the previous experiment, and in Exp. A only minor melodies were used. We see that the numbers are generally close to that of the previous result, so it is possible to say that minor-tonality also can be felt by us in our naive attitude as well as major-tonality. The relation between major and minor will be considered more minutely in the next part of this article.

The figures in Table 3 differ considerably from those in Table 2. This is due to the difference of the relation of melody in Series I, II and III, IV. The individual differences and the difference between the results of each series will be described later. The object of Exp. B was to see the relation of minor to major-tonality; so the result will be considered in the next paragraph.

From Table 8 we know that the tones corresponding to the tonic and the dominant respectively were very prominent in our consciousness while we sang or imagined melodies. The numbers of cases in which the 'agreeable and easily intonable tone' was required before and after the melody were the same, and this time just half of the melodies began on the tonic and the other on the dominant, so it is possible here to compare the strength of psychic energy of tonic and dominant.

In Table 9 and 10 we see the differences of results due to series and subjects respectively. In Table 9 the numbers of the cases of the 'same tonality' and the 'same tone' are entirely the same in Series I and II. This comes from the relation of the melodies in these series as mentioned before. That is, here the case of the 'same tonality' is at the same time that of the 'same tone' and vice versa. Therefore the numbers 128 and 102 indicate both cases. This is the reason why the numbers in Series I and II are larger than those in Series III and IV. In the former series the numbers of cases in which the first notes of neighbouring melodies differ by a fourth or fifth from each other were also counted (Table 3 and 5), and in Exp. A the percentage was 8, in Exp. B 14. It is possible that, in Series III and IV such a tendency is also contained, though partially, in that of the 'same tonality'.

Comparing the figures in Series III and IV, we find that they resemble each other very much, and this can be seen in other tables also. I think this is a proof of the success of the experi-



ment, as the objective nature of series III and IV stands very near in relation.

In the previous experiment on major-tonality two types of the subjects were seen. In one of them the number of cases of the 'same tonality' was greater, and in the other that of the 'same tone'. In this experiment also, we can see the typical differences. Table 10 is applicable for the purpose. Subj. Ay., Az., Mk. and Tr. belong to one group and Subj. Ab., Sk., Tb. and Tk. form the other. Subj. Ab., whose cases of 'same tone' and 'upper and under second' were 8 and 11 respectively, belongs to the group in which the 'same tone' tendency is predominant, for, as was mentioned in the former article, the 'same tone' and 'upper and under second' are closely related. This time he showed a different type from what was seen in the former experiment. Subj. Ay., Az. and Sk. showed the same type as before. Subj. Tk. increased the cases of the 'same tonality', yet the tendency of the 'same tone' was superior, and it may be considered that his type also did not change.

The results of Subj. Ab. and Tb. fairly differ from the previous ones. This may have something to do with one tune ("Senyu") which was used this time by these two subjects and subj. Mk., ie. one that was, strictly speaking, not constructed in minor. But, examining their results in detail, it is clear that this was not the chief reason. Besides, by Subj. Mk. who also used the melody, it was not felt as being of some different tonality, but was always sung as a minor melody beginning on the dominant.

It may be said that, generally the types of each subject (except Subj. Mk. and Tr. who did not engage in the previous experiment) were maintained. It is questionable, however, if a certain personal type can appear in such a partial and special region of mind. It is not also the chief object of this study to investigate individual differences and types. For that purpose it is necessary to employ the proper procedures of experiment.

The following are some of the introspections reported by the subjects. They have almost the same content as before, so here we limit ourselves to noting them.

Subj. Ab. ; "Generally I begin to sing from the easily inton-

able tone which I sang at first, but there is also another tone which is easy to begin with. This is not random, but fixed". (in Series III, Exp. B.) "The 'easily intonable tone' prescribes the melody, but at the same time, when it is sung after the melody, it is also regulated by a tone which belongs to the melody and was impressive to me."

Subj. Ay.; "The initial tones of the melodies are always the same. This happens of itself." (in Series I, Exp. A.)

Subj. Tk.; "Sometimes I endeavoured to begin to sing from a different tone, but it was useless." (Series II, Exp. A.) "The tone I have sung as the 'agreeable tone' is very predominant in the consciousness now."

Subj. Tr.; "The first tone of "Auld lang syne" was too low and was hard to intonate. But it was as if I was obliged to sing the tune from that tone."

#### 4. The relation of minor- to major-tonality

The relation between major and minor is a problem which has ever been discussed. We wanted to examine it from the psychological standpoint. This study was limited to experimental investigation through melody only.

First let us compare the result of Exp. A with that of major.—Table I of this article compared with that of the previous one :

	Case of same tonality	Case of same tone	Case of second	Other cases
Minor-tonality	57 %	30 %	6 %	7 %
Major-tonality	49 %	34 %	10 %	7 %

Here we find very similar results. According to a general view of the matter, the tone relation of minor-tonality is often considered to be more difficult to grasp than the major. Our result shows a contrary relation. However, I do not want to consider this showing the grade of difficulty. I only note that we gained almost the same results for major- and minor-tonality.

Then we must consider the qualitative relation of both tonalities. The results in Exp. B are applicable for this purpose.

Comparing the cases of 'same tonality' in Exp. A and B we find that they are very near in number.

Exp. A

I + II = 85 %

III + IV = 57 %

Exp. B

I + II = 74 %

III + IV = 66 %

This tells us that a tendency to sing the neighbouring major and minor melodies with one common tonic was superior. But the relation of parallel key that we learn in the theory of music could scarcely be found at all in our results. Searching for this in series I and II of Exp. B, we obtain the following figures :

Subject	Ab.	Ay.	Az.	Mk.	Sk.	Tb.	Tk.	Tr.	Total
The case	1	0	0	0	0	1	1	0	3(2%)

For such a small number it is not possible to assume a definite tendency. Sometimes the symmetry-relation is excessively maintained as the relation between major and minor, but we must not forget the existence of the analogy-relation between them<sup>1</sup>. We find chiefly the latter in the result of this investigation in which tonality was felt through melody.

## 5. Summary

1. The tone relation of minor-tonality also could be felt by us in our naive attitudes as well as major-tonality.
2. General results as to the consciousness of tonality were almost the same as those of the previous study.
3. The types of two subjects changed this time from what they were shown to be before, but types were maintained by four persons.
4. As the relation of minor- to major-tonality, analogy-relation was clear, while scarcely any parallel key relationship could be found in our result.

(Received 23. VIII, 1935)

<sup>1</sup>. See Güldenstern, G. "Problem der Tonalität" 1927.